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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,241	08/31/2001	Fumiaki Matsushima	93191-000277	1301

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EXAMINER

NGUYEN, HA T

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 09/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/945,241

Applicant(s)

MATSUSHIMA ET AL.

Examiner

Ha T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-15,17,18 and 30-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3 is/are allowed.
- 6) ☒ Claim(s) 1,4-15, 17,18,40-49 is/are rejected.
- 7) ☒ Claim(s) 30-39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 3-13-03 has been entered and made of record (Paper No. 11).

Response to Amendment

2. In view of Applicants' cancellation of the claims, the rejection of claims 2 and 16 under 35 U.S.C. 103, as stated in Paper No. 10, is rendered moot.

In view of Applicants' amendment to the claims, the rejections of claims 1, 3-15, 17, and 18 under 35 U.S.C. 102 or 103, as being anticipated by Saitoh (U. S. Patent 6093964, hereinafter "Saitoh") or Dion (U. S. Patent 5130275), or unpatentable over Saitoh or Dion in view of the applied references as stated in Paper No. 10, have been withdrawn.

Applicants are referred to the new ground of rejection given below.

Claim Objections

3. Claims 4-14, 19-38, and 40-49 are objected to for containing the following informalities: in claim 4, second line from the end, the limitation "space between each of the metal posts" is not correct because in this context the word "between" requires at least two metal posts not "each" as claimed. In claim 5, lines 3-4, claim 6, lines 3-4 from the end, in both claims 7 and 8, lines 6-7, similarly in claims 30-33, and 40-43, changing the wording of "in a state in which the resist layer is formed" is suggested for clearer meaning of the phrase. Appropriate correction is required.

Claims 9-14, 34-39, and 44-49 variously depend from claims 5, 6, 30, 31, 40, and 41, they are objected to for the same reason.

Claims 19-38 are misnumbered, they are renumbered as 30-49, respectively. Applicants are required to make amendment to the claims for proper dependency.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh in view of Chiu (USPN 6414849).

[Claim 1] Referring to Figs. 3-8 and related text, Saitoh discloses a method for forming a bump comprising the steps of: forming a resist layer 7 to have a through-hole located on a pad 3, the resist layer having an inner surface to define the through hole; and forming a metal post on the pad conforming to the shape of the through-hole (see Fig. 6). But it does not disclose expressly the inner surface having a portion projecting inwardly in the through-hole so as to have a side surface having a recess formed therein. However, the missing limitation is well known in the art because Chiu discloses a metal post 906,908 having a recess formed in the side surface (See col. 9, lines 21-64). A person of ordinary skill is motivated to modify Saitoh with Chiu to obtain reliable bonding with less spacing between posts.

[Claim 5] Saitoh also discloses wherein the metal post comprises first and second metal posts, wherein the first metal post is formed in a state in which the resist layer is formed, and the second metal post is formed on the first metal post (see Figs. 8 and 9).

Therefore, it would have been obvious to combine Saitoh with Chiu to obtain the invention as specified in claims 1 and 5 .

6. Claims 4, 40, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh et al. (EPN 766310A2, hereinafter "'310") in view of Chen (USPN 6191023).

[Claim 4] Referring to Figs. 1-8 and related text, '310 discloses a method for forming a bump comprising the steps of: forming a resist layer 24 to have through-holes located on pads 32, and forming metal posts 3a or 25 on the pads conforming to the shape of the through-hole so as to have a space between each of the metal posts for receiving a soldering or brazing material. But '310 does not disclose expressly forming holes on a pad. However, the missing limitation is

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well known in the art because Chen discloses this features (See fig. 1). A person of ordinary skill is motivated to modify '310 with Chen to obtain better adhesion.

[Claim 40] '310 also discloses wherein the metal post comprises first and second metal posts, wherein the first metal post 3a is formed in a state in which the resist layer is formed, and the second metal post 3b is formed on the first metal post.

[Claim 42] Chen also discloses wherein the pad is covered with an insulating film 4, the resist layer 5 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad in as state in which the resist layer is formed (see Figs. 1-3).

Therefore, it would have been obvious to combine '310 with Chen to obtain the invention as specified in claims 4, 40, and 42 .

7. Claims 6, 41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh in view of Chiu or '310 in view of Chen, as applied above, and further in view of Dion [USPN 5130275].

[Claims 6 and 41] The combined teaching of Saitoh and Chiu or '310 and Chen discloses substantially the limitations of claims 6 or 41, as shown above. But Saitoh and Chiu or '310 and Chen does not disclose expressly the forming of the second post after removing the resist layer. However, the missing limitation is well known in the art because Dion discloses this feature (See Figs. 7-11). A person of ordinary skill is motivated to modify Saitoh and Chiu or '310 and Chen with Dion to obtain a more accurate control of the size of the spacing adjacent the side of the metal posts.

[Claim 43] Chen also discloses wherein the pad is covered with an insulating film 4, the resist layer 5 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad in as state in which the resist layer is formed (see Figs. 1-3).

Therefore, it would have been obvious to combine Saitoh and Chiu or '310 and Chen with Dion to obtain the invention as specified in claims 6, 41, and 43.

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8. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Saitoh and Chin or Saitoh, Chin, and Dion, as applied above, and further in view of Chen.

The combined teaching of Saitoh and Chin or Saitoh, Chin, and Dion discloses substantially the limitations of claims 7 and 8, as shown above.

But it does not disclose expressly wherein the pad is covered with an insulating film, the resist layer is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad in as state in which the resist layer is formed.

However, Chen discloses these features, as shown above.

Therefore, it would have been obvious to combine Saitoh and Chin or Saitoh, Chin, and Dion with Chen to obtain the invention as specified in claims 7 and 8.

9. Claims 9-14 and 44-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the respective combination of the references applied to claims 5, 6, 40, or 41, as shown above, and further in view of Watanabe et al. (USPN 6218281, hereinafter "Watanabe").

The respective combined teaching of the references applied to claims 5, 6, 40, or 41 discloses substantially the limitations of the related dependent claims 9-14 and 44-49 as shown above.

But each combination of the applied references does not disclose expressly the electroless plating of the first and second metal layers and the materials used for the first and second metal layers.

However, the missing limitations are well known in the art because Watanabe discloses the use of electrolysis plating to form the bump electrode 66 and that the upper interconnect 47b can be formed of Ni (See col. 13, lines 37-41 and col. 14, lines 3-12).

A person of ordinary skill is motivated to modify each combination of the applied references with Watanabe to use electroless plating for reduction of production cost and to use Ni and Au as materials for the first and second metal layers to obtain better adhesion and better quality.

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Therefore, it would have been obvious to combine each combination of the applied references with Watanabe to obtain the invention as specified in claims 9-14 and 44-49.

10. Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over '310 in view of Chiu.

[Claim 15] '310 discloses substantially the limitations of claim 15, as shown above. But it does not disclose expressly each of the metal posts having a side surface in which is formed a recess for receiving the soldering or brazing material, wherein the soldering or brazing material, when melted, is allowed to flow into the region of each of the metal posts for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads. However, the missing limitation is well known in the art because Chiu discloses this feature, as shown above.

[Claim 18] '310 discloses substantially the limitations of claim 18, as shown above. But it does not disclose expressly a space being provided between each of the metal posts, wherein the soldering or brazing material, when melted, is allowed to flow into the space for receiving the soldering or brazing material so as not to spread onto another pad adjacent to the pad. However, the missing limitation is well known in the art because Chiu discloses this feature, as shown above.

Therefore, it would have been obvious to combine '310 with Chiu to obtain the invention as specified in claims 15 and 18.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over '310 in view of Chikawa et al. (USPN 5310699, hereinafter "Chikawa").

'310 discloses substantially the limitations of claim 17, as shown above. It also discloses wherein the soldering or brazing material, when melted, is allowed to flow into the sides of each of the metal posts so as not to spread onto an adjacent pad of the plurality of pads. But '310 does not disclose expressly each of the metal posts having a hole exposing the pad. However, the missing limitation is well known in the art because Chikawa discloses this feature (See Fig. 2F). A person of ordinary skill is motivated to modify '310 with Chikawa to obtain more reliable device.

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Therefore, it would have been obvious to combine '310 with Chikawa to obtain the invention as specified in claim 17.

Allowable Subject Matter

12. Claim 3 is allowed and claims 30-39 would be allowable if rewritten to overcome the objection for informality.

Claim 3 recites forming a resist layer to have a through-hole located on a pad, the through-hole having a ring shape so that part of the resist layer remains at the center of the through-hole... the metal post has a hole exposing the pad.

These features in combination with the other elements of the claims are neither disclosed nor suggested by the prior art of record.

Claims 30-39 variously depend from claim 3, they are allowed for the same reason.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first response is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (703)308-2706. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling, can be reached on (703) 308-3325. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Ha Nguyen
Primary Examiner
8-22 - 03